ScanWave Pro™ E

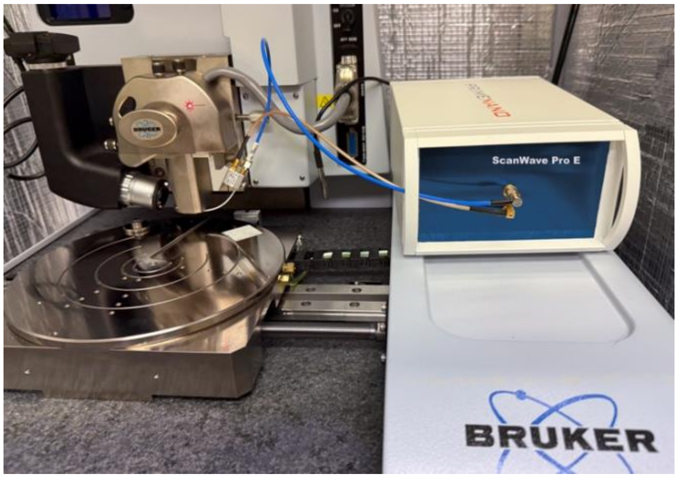
Breakthrough in Scanning Microwave Microscopy (ScanWave™)

KEY FEATURES

- **Improved S/N by over 300% compared to ScanWave Pro™**
- **Comprehensive system optimization in 3-4 seconds**
    - **Probes, PIM, Cables, electronics**
    - **In-situ system optimization resulting in significantly improved performance (S/N, spatial resolution etc.)**
- **Software speed improved by 10-15x**
- **Breakthrough sensitivity of < 0.075 aF**
- **Nanoscale spatial resolution**
    - **Less than 10 nm lateral resolution**
- **High power for subsurface imaging**
    - **Depth range > 200 nm**
- **Proprietary shielded probes**
- **Streamlined probe exchange and optimization**

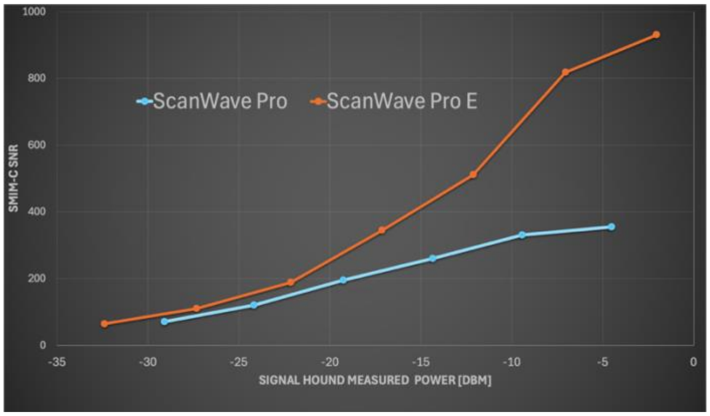
BENEFITS

- **Significant ease of use improvement for most advanced electrical AFM mode**
- **Measure variations in permittivity and conductivity (ε & σ) at the nanoscale**
- **Multiple AFM modes supported**
- **Characterize a variety of electrical properties**
- **Little to no sample preparation required**
- **Electrical measurements on insulating substrates**
- **Subsurface imaging for buried structures**
- **Tool-less probe exchange**
- **Bruker, Park and Asylum AFMs**



ScanWave Pro™ E

Tool less electronic probe holder



Signal to Noise improvement

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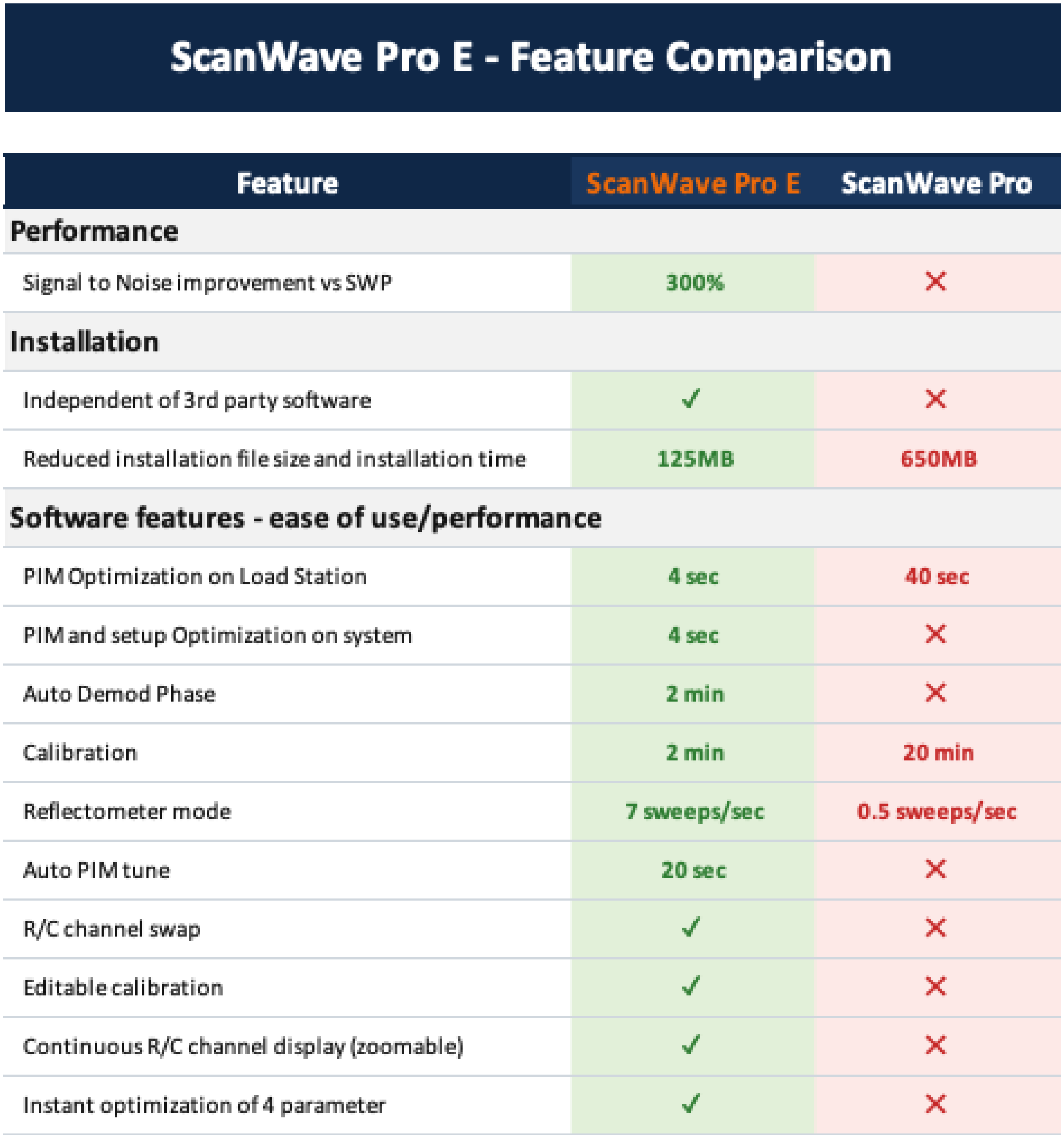

ScanWave Pro E - Feature Comparison

Feature	ScanWave Pro E	ScanWave Pro
Performance		
Signal to Noise improvement vs SWP	300%	✕
Installation		
Independent of 3rd party software	✓	✕
Reduced installation file size and installation time	125MB	650MB
Software features - ease of use/performance		
PIM Optimization on Load Station	4 sec	40 sec
PIM and setup Optimization on system	4 sec	✕
Auto Demod Phase	2 min	✕
Calibration	2 min	20 min
Reflectometer mode	7 sweeps/sec	0.5 sweeps/sec
Auto PIM tune	20 sec	✕
R/C channel swap	✓	✕
Editable calibration	✓	✕
Continuous R/C channel display (zoomable)	✓	✕
Instant optimization of 4 parameter	✓	✕

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Innovation and Improvements

Signal to Noise improvements

PrimeNano optimized the world-class ScanWave Pro™ electronics design, significantly enhancing the Signal-to-Noise (S/N) performance of **ScanWave Pro™ E**.

Usability, automation and Software improvements

ScanWave Pro™ E offers vastly improved usability. We have enhanced all software functions by a factor of 10X to 15X.

Standard optimization functions are now measured in single-digit seconds, enabling entirely new usage models and significantly improving practicality and productivity for commercial applications.

In situ optimization of system

ScanWave Pro™ E facilitates in-situ automated software optimization of your complete setup within seconds. This ensures that the system operates at its optimal configuration consistently and also eliminates the human factor in the measurement setup.

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Application Examples

Highest Sensitivity Subsurface Imaging

ScanWave Pro^{TM} E boasts a 300% increase in signal-to-noise ratio (SNR) compared to ScanWave Pro^{TM}, and around 10x increase in SNR compared to ScanWave 2.0^{TM}.

Figure 1 show sMIM-C imaging of a repeating SiO_2 structure buried beneath 190 nm of Si_3N_4, performed with the ScanWave Pro^{TM} E. Figure 2 and 3 show ScanWave Pro^{TM} E achieves a superior image with clearer features due to its improved SNR performance

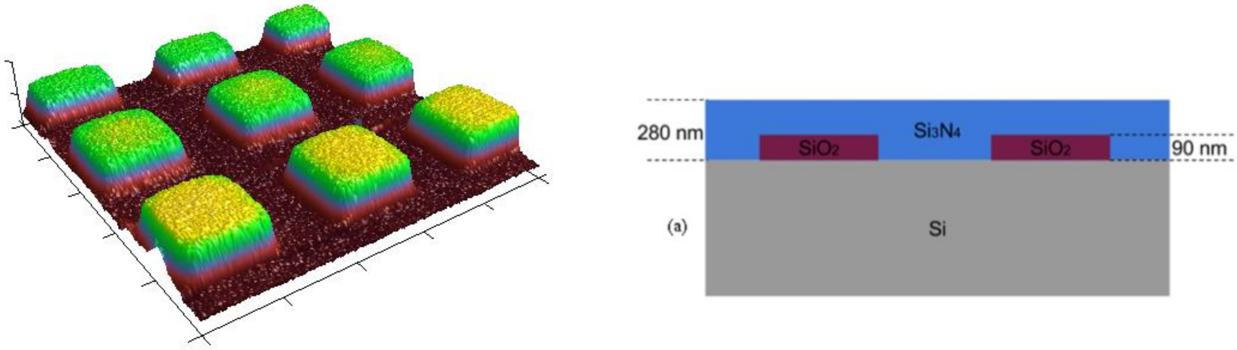

Figure 1 ScanWave Pro^{TM} E image of buried SiO_2 structures

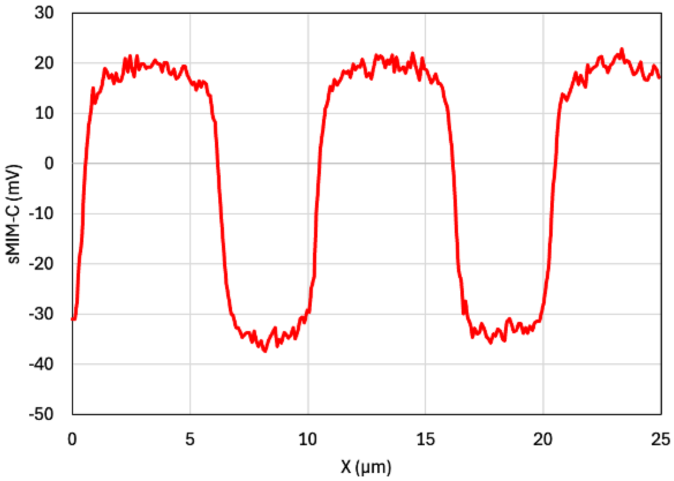

Figure 2 ScanWave Pro^{TM} E

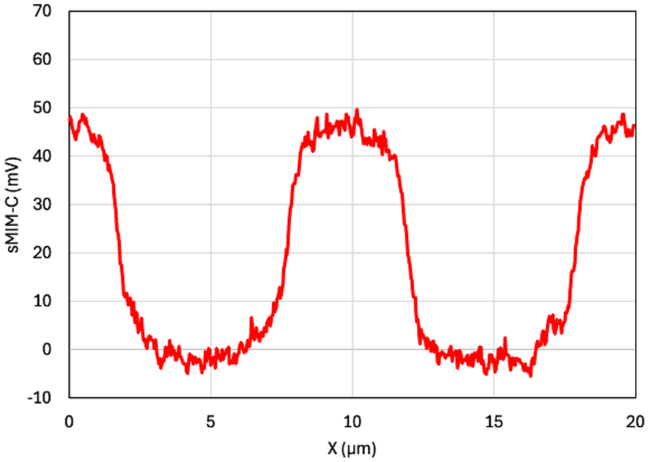

Figure 3 ScanWave Pro^{TM}

Rapid, Selective Probing of Dopant Polarity & Concentration (SRAM images)

By applying additional tip biases during sMIM measurements, the ScanWave Pro™ E can probe samples for dopant polarity (dC/dV Phase) and dopant concentration (dC/dV Amplitude). Moreover, the dC/dV measurements can be tuned to specifically and separately probe n-type and p-type dopants.

Figure 4 is a 3D topography image of an SRAM sample with dC/dV Phase color mapping showing clear identification of n-type (blue) and p-type (yellow) regions of the device. Figure 5 is the same 3D topography image instead with dC/dV Amplitude color mapping, probing n-type (light & dark blue) and p-type (pink) regions selectively based on dC/dV measurement parameters.

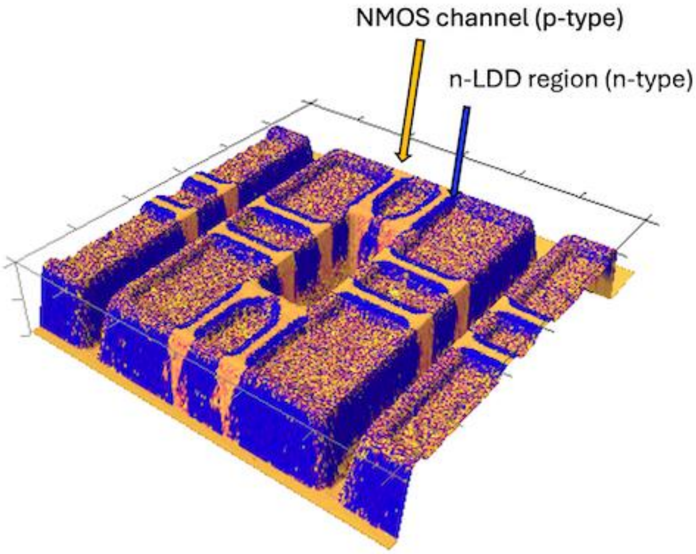

Figure 4 SRAM dC/dV Phase

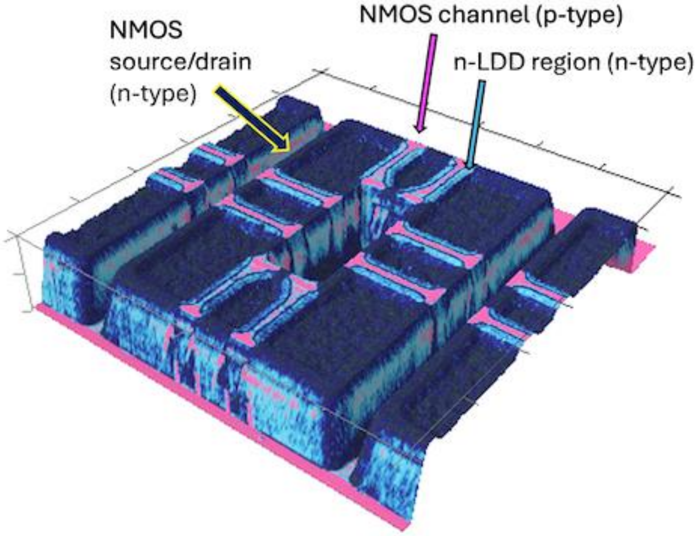

Figure 5 SRAM dC/dV Amplitude

Nanometer-scale Resolution for Semimaterials

The ScanWave Pro™ E can reliably resolve structures on the order of 10 nm with scan times of only a few minutes. Figure 6 shows a 1 µm x 200 nm sMIM-C image of stacked layers of SiO_2 and doped Si of varying layer widths. The linescan data clearly depicts layers as thin as 12 nm and 15 nm, identified via FWHM of peaks and valleys.

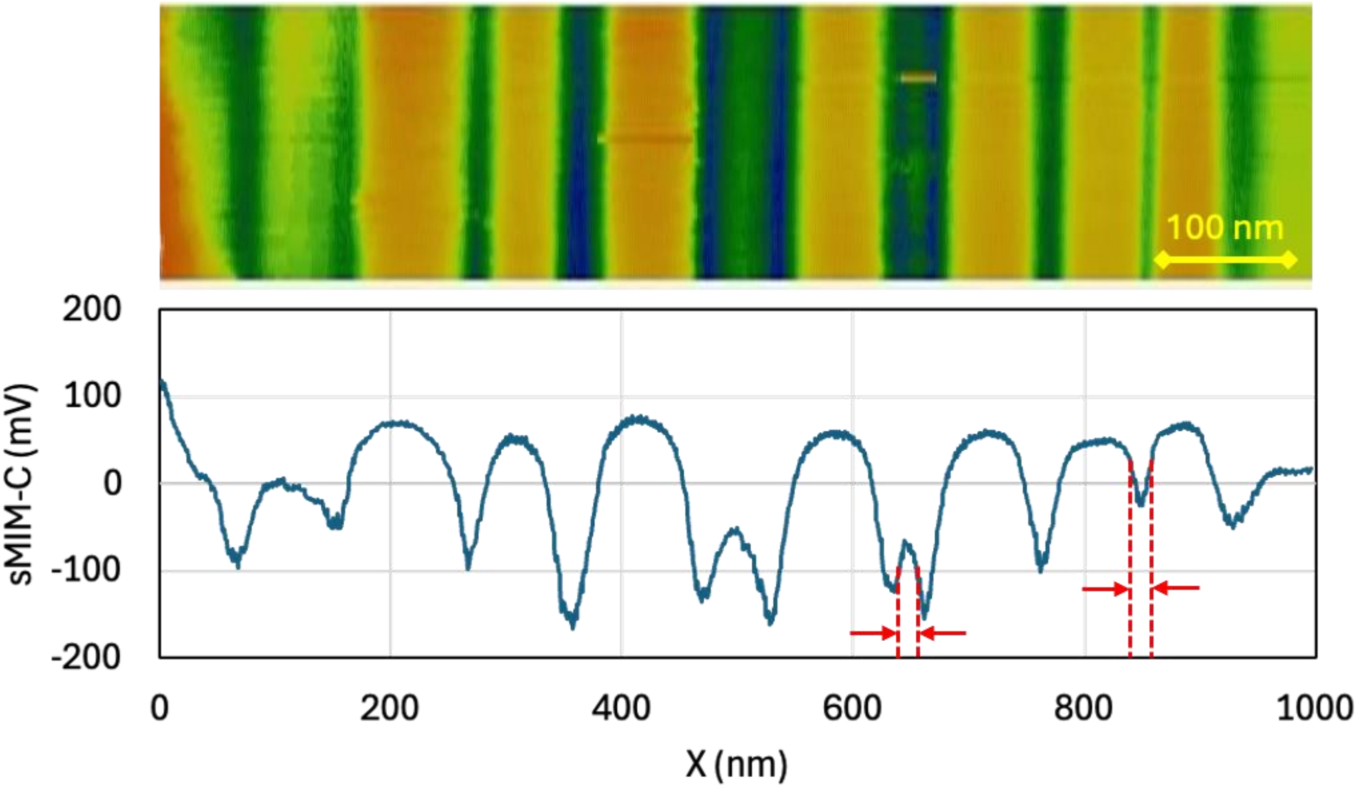

Figure 6 ScanWave Pro™ E Imaging of Stacked Layer Sample

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